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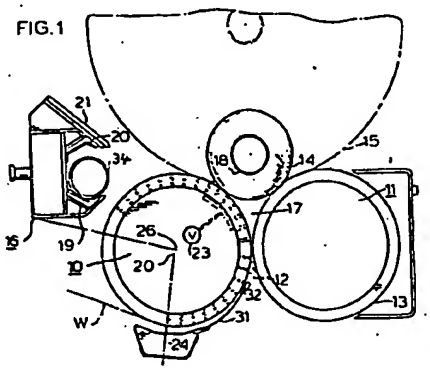
(54) Papermachine winder with a cut-off knife.

(57) A paper machine winder (17) for winding paper web (W) having parallel rotatable winder drums (10,11) providing a winding nest (17) therebetween with a core carrier (16) movable to drop a fresh core (34) into the nest and having a roll ejector (21) for pushing a wound roll (15) out of the nest, a means for applying an adhesive to the surface of the core (34) and a knife (31) for severing the trailing end of the web (W) when the roll is completely wound, the knife (31) being movable in a path eccentric to the first drum (10) and extending the full length of the drum, the first drum being perforate (12) and having vacuum means (23) therein.

FIG.1



EP 0 118 384 A1

PAPERMACHINE WINDER WITH A CUT-OFF KNIFE.

The present invention relates to improvements in paper machine winders, and more particularly winders which receive a continual supply of paper web at a high speed, wind it into a roll and automatically discharge the wound roll, provide a fresh core for starting a new roll and sever the web to release the wound roll and start the lead end of the fresh web onto the new core. The features of the invention particularly relate to an improved mechanism for performing the sequence of operations necessary to cut the web in an improved manner.

As is known, with developments and improvements, there is a constant increase in the speed of paper machines. The economics of such improvements are obvious inasmuch as a papermaker reduces his cost of operation and capital equipment if his output on any given machine can be increased. One example of speed increases has been in newsprint machines which operate frequently at 1000 meters per minute (3300 fpm) and are being designed for 1200 meters per minute (4000 fpm) with the speed capabilities continually increasing. Frequently, such winders are used in conjunction with papermaking machines, and as the speed and output of the papermaking machine increases, the speed capability of the winder must also be increased. The paper machine winder operates essentially as a batch operation, with the winding being temporarily stopped between each wound roll to allow for cutting the web and for starting the web on a fresh core. Additionally, time must be allowed for splices, slitter setting changing, blade changes, and with the temporary shut-down necessary, the winding machine must operate at a sufficiently high speed to catch up with the output of the papermaking machine. The rule of thumb used to be that the winder should be designed for three times the paper machine speed. However, when winding rolls of smaller diameters such as 100 cm which is customary for newsprint, merely increasing the top speed of the winder is of limited value because the run times are too short between completing the roll and beginning a fresh roll.

It is accordingly an object of the present invention to improve the speed of output of a paper machine winder by shortening the down times, and in particular providing improved structure for cutting the web and facilitating the discharge of the wound roll and the starting of the fresh roll.

In devices heretofore available, the most consistently recurring down-time in a paper machine winder is caused by changing roll sets. As the winder is decelerated to a halt, chucks are retracted, guards positioned, the wound roll is discharged onto a table or a cradle, new cores are inserted and fastened to the tails, guard and rider roll are lowered, chucks are inserted and the winder is started again. Automatic sequence of these operations has improved the speed of operation and reduced the time needed between rolls, but even with these functions integrated into a fully automatic machine, the downtime between cores is relatively large.

A further object of the invention is to provide an improved structure for the operation of a two-drum or shaftless winder wherein the time required between rolls is reduced to increase the total output of the machine and reduce the overall operation time for winding rolls. A feature of the invention is to provide for rapid automatic change-over from the complete wound roll to starting the fresh core in a manner which is reliable to the extent of starting a fresh core without losing the web, and in particular cutting the web in an improved manner. When the full core is completed, it is pushed out of the winding nest between the drums, a full-width serrated knife is moved upwardly between the drums into the nest in a unique path having a center eccentric to the first drum to intersect the web simultaneously while being ejected. The web is cut by the knife on the first drum, which is a suction drum, and simultaneously, a fresh core is brought into the nest between the drums having been prepared by adhesive on its surface, and the cut lead end of the web is

immediately started onto the fresh core with the whole intermediate operation between ejection of the roll and starting of the fresh core being maintained at a minimum so as to be accomplishable in a time span of somewhere between 30 and 50 seconds. By the reduction of the time between rolls, the overall output of the machine is increased so that the winder can more readily keep up with the output of a high speed papermaking machine.

Other objects, advantages and features, as well as equivalent structures and methods which are intended to be covered herein, will be more apparent from the teaching of the principles of the invention in connection with the disclosure of the preferred embodiments thereof in the specification, claims and drawings in which:

Figure 1 is an end elevational view, shown somewhat schematically, of a two drum winder constructed and operating in accordance with the principles of the present invention showing the condition of the wound roll as it builds up to full size;

Figure 2 is another schematic end elevational view illustrating the beginning of forcing the wound roll out of the winding nest between the drums;

Figure 3 is another schematic end elevational view showing the web being cut just prior to the wound roll being ejected and a fresh core being dropped into the winding nest;

Figure 4 is another schematic end elevational view showing the fresh core dropped into place, the knife being retracted, and winding started on the core;

Figure 5 is another schematic end elevational view showing the core insertion mechanism being withdrawn and winding being started on the fresh core; and

Figure 6 is another schematic end elevational view showing the operation of the mechanism when a bad start is encountered with the improperly started roll being ejected.

As illustrated in each of the Figures, the two drum winder mechanism includes first and second drums 10 and 11 extending horizontally on parallel axes with means to drive the drums in rotation. The drums define a winding nest 17 therebetween for supporting a roll being wound with the roll shown at 14 in Figure 1 as it is begun, and at 15 in Figure 1 as it is being completed.

A web W is led over the first or front drum 10 which is constructed as a perforated roll shell having perforations 12 therethrough. The drum becomes a vacuum chamber by applying vacuum to the front side drum journal by means shown schematically at 23. The suction holds the web to the roll when the web is severed.

The second or back drum 11 will present a smooth supporting surface 13 to the roll 14 being wound.

Operating in conjunction with the winding drums is a core carrier 16 which operates to bring a fresh core into the winding nest 17 and has a roll ejector surface 21 for forcing the wound roll out of the winding nest onto roll table 32a shown in Figure 3.

The core carrier receives a fresh core 34 and holds the fresh core between movable jaws 19 and 20 which receive a fresh core and drop it at the appropriate time when the carrier is moved over the winding nest.

For severing the web when the wound roll 15 is complete, a knife 31 is supported on a knife carrier and arm 24 and moved upwardly between the drums from a recessed position, as shown in Figure 1, to a cutting position, as shown in Figure 3. The knife has a concave curvature essentially conforming with the outer surface of the drum 10. The knife extends continuously across the full width of the web and has a serrated cutting edge 32.

The arm for carrying the knife moves pivotally to carry the knife between the recessed position and the cutting position movable about a center 25 which is slightly eccentric from the rotational center 26 of the

drum 10. This will move the knife 31 in a generally concentric path with the roll, but moving the cutting edge 32 ever increasingly closer to the surface of the web as it moves into the final cutting position of Figure 3.

In winding operation, as shown in Figure 1, the web W feeds under the front drum 10 up onto the surface of a roll 14 being wound. The rolls 10 and 11 are driven rotationally at the surface speed of the rotation of the roll 14 being wound with control as to the tightness of winding and the tightness of the roll being obtained by applying a controlled torque differential to the rolls 10 and 11 as will be recognized by those versed in the art. When the roll is wound to the desired size as indicated at 15 in Figure 1, the carrier 16 is moved to the right as indicated schematically by the arrowed line 26 in Figure 2.

Prior to the roll 15 being completed, a fresh core 34 is placed into the carrier and the holding jaws 19 and 20 are brought together to clamp the core as shown in Figure 2. An adhesive substance is applied to the outer surface of the core either by an adhesive spray means extending for the full length of the core or by means applying an adhesive tape to the core surface. The adhesive on the outer surface of the core will serve to form an attachment for the lead end of the paper web when it is cut. When roll 15 is completed, drums 10 and 11 are slowed to a stop.

As the carrier 16 is brought to the right as shown in Figure 2, the surface 21 on the carrier engages the outer surface of the roll and the carrier, acting as an ejector, forces the roll to the right, as shown in the drawings, up over the back drum 11 onto the roll receiving table 32a.

The knife 31 has begun its travel, as indicated by the arrowed line 25 from its recessed position, shown in Figure 1, toward the cutting position of Figure 3.

Movement of the knife is in a curved path up between the space between the drums 10 and 11.

Referring to Figure 3, when the completed roll 15 moves up over the drum 11, drum 11 is free to rotate, and the knife has travelled to its cutting position of Figure 3, as indicated by the arrowed line 25, to where it intersects the web at point 30. The completed roll pulls the web taut over the serrated edge of the knife, which extends the full width of the web, and the web is cut.

Vacuum is applied to the roll 10 to hold the cut lead end of the web in place. Vacuum will be controlled by a mechanism shown at 23 schematically in Figure 1 in a manner which will be fully appreciated by those versed in the art.

At that point, the fresh core is brought fully over the nest 17 between the drums as illustrated in Figure 4. The fresh core 34 is dropped by separating the jaws 19 and 20, and the lead end of the cut web will adhere to the adhesive surface of the core 34 upon start of rotation of drums 10 and 11. As the lead end follows around with the core, it immediately begins to wind onto the core starting a new roll as illustrated in Figure 5. In the meantime, the knife has moved back down to its retracted position, as indicated by the arrowed line 25 in Figure 4 to where it is in the retracted position of Figure 5 where it remains during the winding operation. The carrier 16 is withdrawn to the position shown in Figure 5 in advance of the front drum 10 ready to receive a fresh core.

A feature of the invention is the reliable and secure cutting operation which occurs in Figure 3 in such a manner that the functions of cutting and bringing the fresh core can be performed very rapidly substantially shortening the time between the ejection of the complete roll and the starting of the roll onto the fresh core. If the cutting is not accomplished reliably and rapidly,

not only will the amount of time consumed be increased, but the chance of losing the lead end of the web will be increased. If such a mishap occurs at this point, time must be allotted for the operator to pick up the lead end of the web and correct the deficiencies and this greatly slows the overall operation of the winder. Furthermore, if a mishap occurs at cutting, the starting of the lead end onto the fresh core can malfunction resulting in a bad start. While the cutting arrangement as illustrated greatly reduces this possibility, the present structure permits ejection of a small roll which has been the result of a bad start, as illustrated in Figure 6. As soon as the bad start is noticed, the carrier can be brought over in the manner indicated by the arrowed line 29 to force the bad start roll 33 out of the nest. Because the fresh core has been placed into the carrier immediately when it is withdrawn to the left as shown in Figure 5, a fresh core 34 will be on the carrier to immediately start a new roll when the bad start roll 33 is ejected. The ejection of the bad start roll, of course, will be accompanied by movement of the knife 31 from its retracted position as shown in Figure 1 up to its cutting position as shown in Figure 3. The lead end will be held onto the drum 10 as it is stopped and the web is cut, so that when the core 34 is dropped into the nest between the rolls, the lead end will immediately be adhered to the surface of the core and the drums again started up with the lead end of the web following the surface of the core.

Thus, the knife having its concave shape, moves along the surface of the front drum 10 into the space between the drums and the lead cutting edge 32 simultaneously cuts the full width of the web in a rapid reliable manner. The intersection of the cutting edge 32 of the knife and the web causes a coaction with the web being held on the stopped drum 10 so that the tension of the web being pulled as the completed roll 15 rolls away from the drums will cause the web to be pulled against

the serrated knife to cause the cutting operation.

The function of the knife in cutting is not limited to one size of roll, but operates in essentially the same fashion with all sizes and is performed automatically as the finished roll is propelled out of the nest between the drums. All of the functions can be accomplished automatically with the parts operating in sequence. The fresh cores can be brought into position from above or loaded axially into the jaws and this can be done rapidly with adequate space being provided by the carrier located above and in advance of the front drum 10.

The knife also functions to sever the tails of the web when the winder is initially threaded without a wound roll resting on the winder drum. In this operation, the winder is threaded in the conventional manner bringing the full width web and/or slit tails around the suction winder drum in a counterclockwise direction. When the web or slit tails are threaded, the knife is rotated counterclockwise with the serrated leading edge moving into a position to capture the threaded tails between the outside surface of the drums 10 and the serrated edge of the knife. The operator then pulls the threaded tails away from the winder and the serrated leading edge of the knife severs the web with the web being held closely between the drum surface and the knife. The tails are severed in a length suitable to continue the automatic operation.

With the knife moving in its path substantially conforming to the outer surface of the drum, but moving along the surface approaching the drum because of its eccentric mounting, the inner concave surface of the knife 31 provides a shield or holder which holds the web captive between the drum and the knife so that the knife performs a dual function of a cutter and safety holder. Thus, any loose or frayed ends of the web will be forced to travel along the surface of the drum aided by suction within the drum. The knife is compactly held and constructed requi-

ring a minimum of space for its operational movement between the drums and moves to a noninterfering inoperative position.

CLAIMS:

1. A paper machine winder, characterized in comprising:

first (10) and second (11) parallel winder drums defining a winding nest (17) therebetween for supporting a roll (14) being wound onto a core (18) with a web (W) being fed onto the roll over the first drum;

a knife (31) extending substantially for the length of the first drum (10) and having a conforming curvature substantially concentric with said first drum (10) and movable in a path toward an operative position into engagement with the web in the nest (17) for severing the web as the wound roll (15) is moved out of the winding nest;

a core supply carrier (16) movable from a retracted position away from the nest (17) to an operative position above the nest (17) for depositing a fresh core (34) to be wound; and

a roll ejector (21) movable into engagement with the wound roll (15) to force it out of the nest preparatory for placing a fresh core (34) into winding position.

2. A paper machine winder constructed in accordance with claim 1, characterized in said first drum (10) being a hollow roll shell with perforations (12) therein and having means (23) for applying a vacuum within the drum to hold the web being wound onto the drum surface.

3. A paper machine winder constructed in accordance with claim 1, characterized in that said roll ejector (21) is carried with the core carrier (16) for engaging and forcing a wound roll (15) out of the nest (17) as a fresh core(34) is brought into the nest.

4. A paper machine winder constructed in accordance with claim 1, characterized in that

said core carrier (16) has a downwardly facing core pocket with jaws (19,20) for holding the core (34) in position and for releasing the core as the carrier is moved into position above the nest (17).

5. A paper machine winder constructed in accordance with claim 1, characterized in including means for applying an adhesive to the full length of the core (34),

prior to the core being moved into the winding nest (17).

6. A paper machine winder constructed in accordance with claim 2, characterized in including means for controlling the vacuum applied to the interior of the first drum (10).

7. A paper machine winder constructed in accordance with claim 1, characterized in that said knife (31) has a serrated cutting edge (32) extending for the full length thereof.

8. A paper machine winder constructed in accordance with claim 1, characterized in that said knife (31) is carried on a knife carrier (24) mounted on a pivotal center below the first drum (10) and further from the nest (17) than the axis of the first drum (10), so that the knife moves in a path eccentric to the curvature of the first drum to substantially intersect with the drum surface as the web is cut.

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FIG. 1

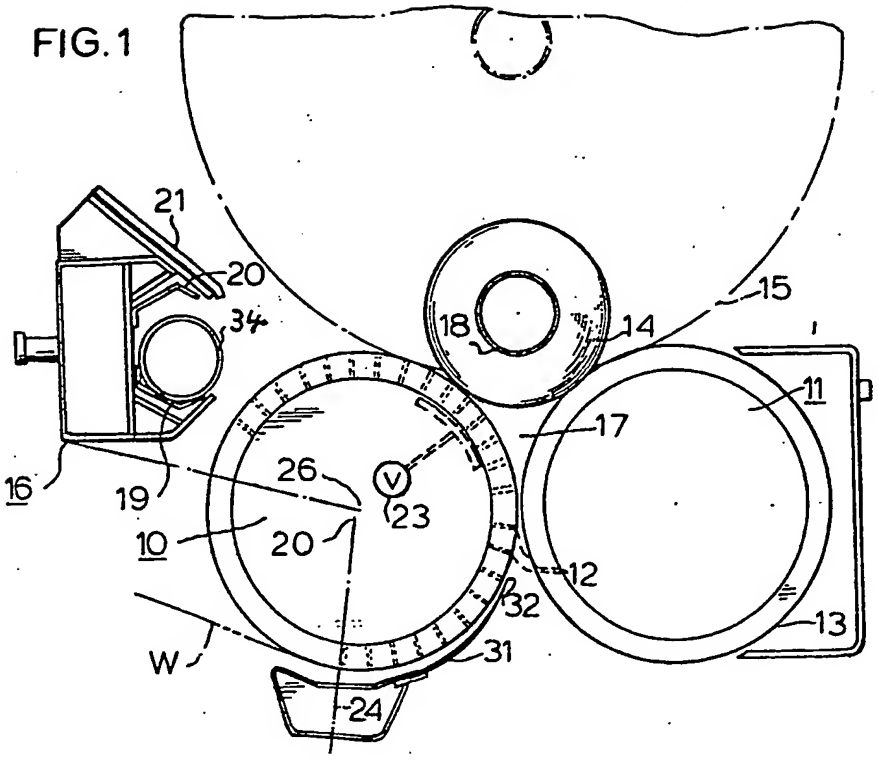


FIG. 2

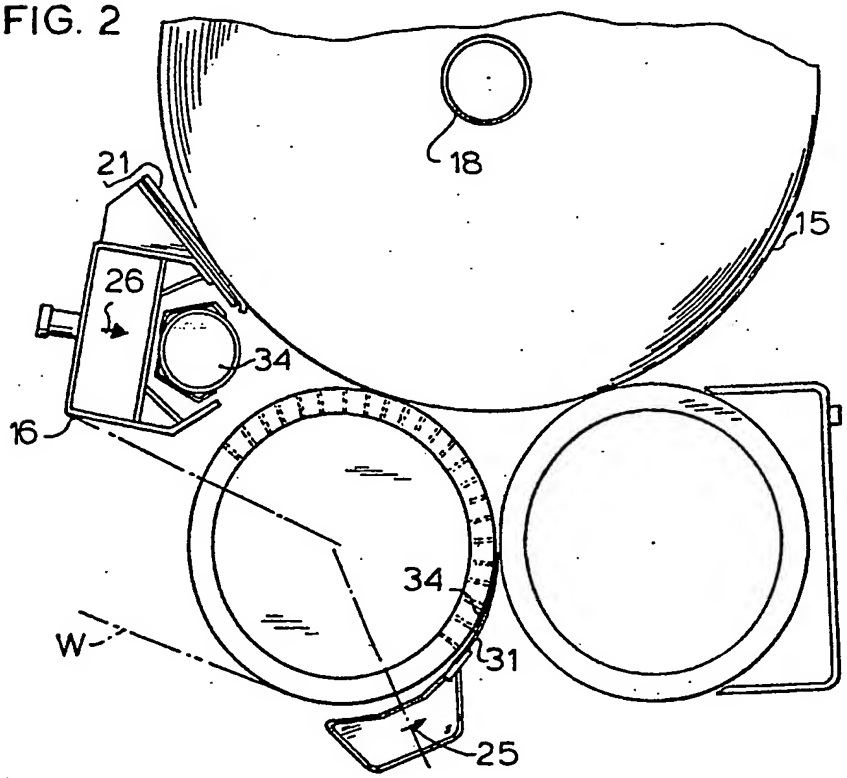
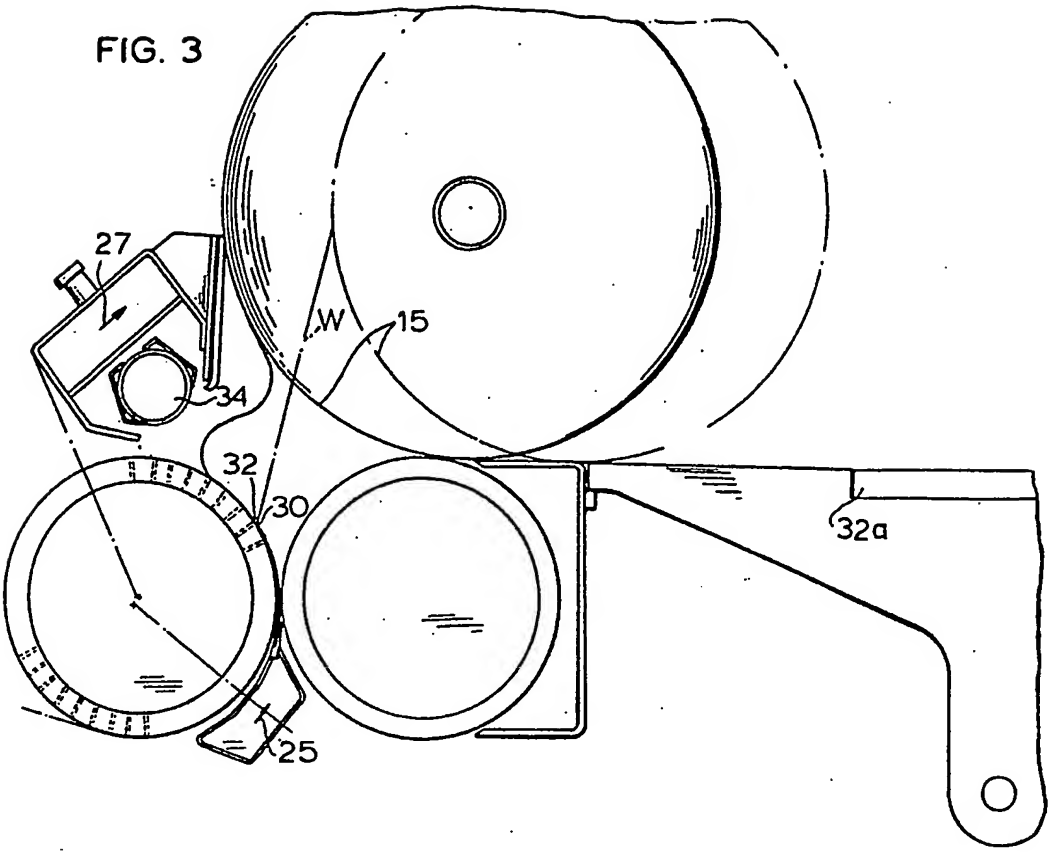


FIG. 3



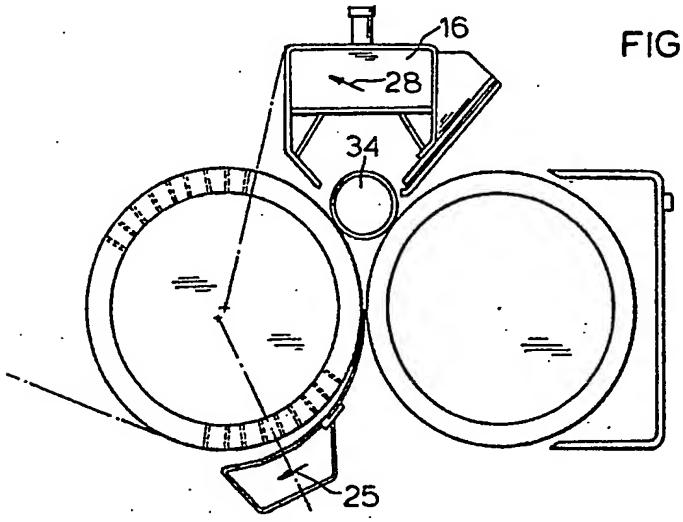


FIG. 4

FIG. 5

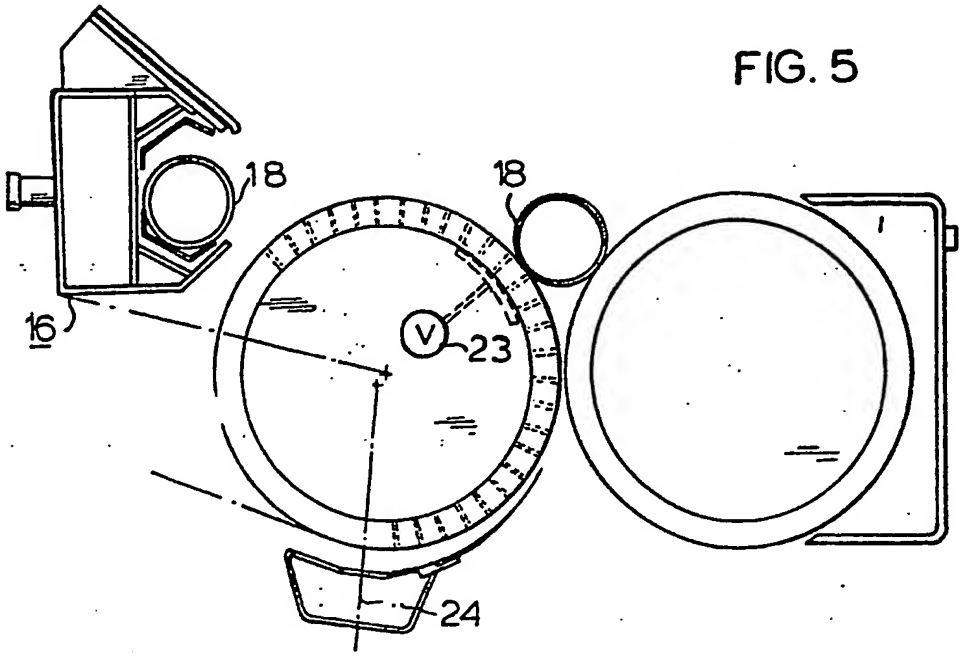
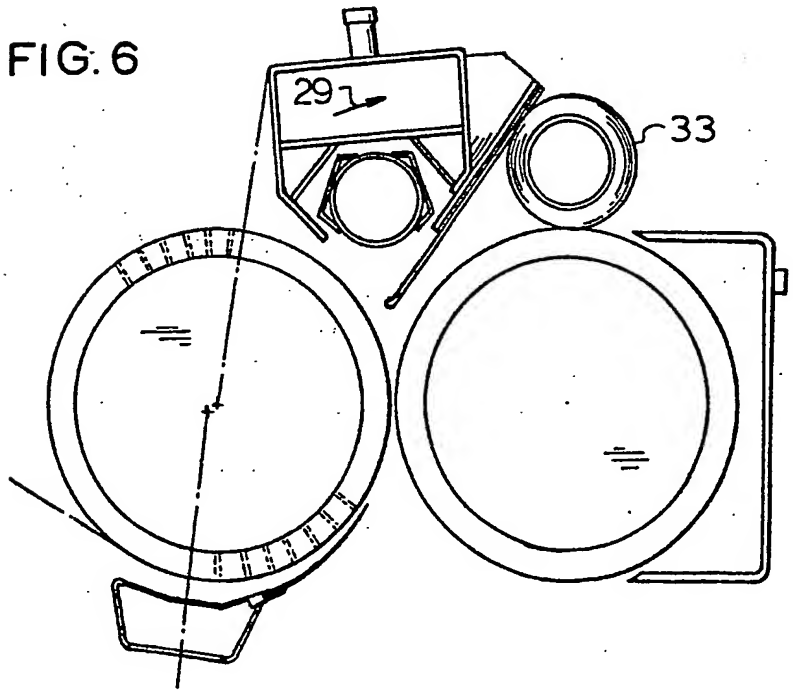


FIG. 6



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Application number

European Patent Office

EUROPEAN SEARCH REPORT

EP 84630016.8

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
X	DE - A1 - 2 920 707 (JAGENBERG WERKE AG.) * Claims 6-11; fig. 4,6; page 7, line 12 - page 8, line 19; page 11 *	1,2,4, 5,6,7	B 65 H 19/30 B 65 H 19/22
X	DE - A1 - 2 948 877 (JAGENBERG WERKE AG.) * Claims 1-3; fig. 1,2 *	1,3,4, 7	
A	DE - B1 - 2 930 474 (J.M. VOITH GMBH) * Claims 1-12; fig. 1 *	1,4,7, 8	
A	DE - B - 1 761 631 (VALMET OY) * Claim; fig. 1 *	1,2,6	TECHNICAL FIELDS SEARCHED (Int. Cl. ³) B 65 H
A	FR - A1 - 2 476 044 (JAGENBERG WERKE AG.) * Fig. 2,5 *	1,7,8	
A	GB - A - 2 091 226 (JAGENBERG WERKE AG.) * Abstract; fig. 2,3 *	1	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	07-05-1984	HABART

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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